

Research Article

Emergency Neonatal Surgery: Outcome in a University Hospital of Pakistan

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ABSTRACT

Objective: The aim was to measure outcome of neonatal emergency surgery in a university hospital of Pakistan.

Methods: A 3 years retrospective study was carried out in department of Pediatric Surgery after ethical approval. Records of all neonates operated in emergency, except orthopedic and neural tube defects repair, were collected. Outcome was analyzed with different variables to see if any association was present using logistic regression.

Results: Total 188 neonates were included with mean age of 7.96 ± 7.88 days and mean weight of 2.59 ± 0.36 kilograms. 124(66%) were male and co morbid conditions were noted in 4.8% neonates, while associated congenital anomalies were seen in 11.7% neonates. Mean days of hospital stay were 7.56 ± 6.14 days. Gastrointestinal anomalies were noted in 75.1%, tracheoesophageal fistula in 9%, diaphragmatic hernia in 2.7% and abdominal wall defects in 4.8% cases. Overall 39(20.7%) neonates died. There was association between outcome and diagnosis, findings, co morbid conditions (p value=0.0001).

Conclusion: Overall neonatal surgical mortality rate in our set up was 20.7% and was mainly seen in cases of gastrointestinal anomalies like necrotizing enterocolitis, mid gut volvulus, pneumoperitoneum with sepsis and in cases of tracheoesophageal fistula with esophageal atresia and gastroschisis.

Keywords: neonatal, emergency surgery, outcome, neonatal mortality.

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INTRODUCTION

In developed countries, mortality associated with neonatal surgery has markedly reduced as a result of earlier diagnosis and better treatment of associated congenital disorders. Meanwhile, in developing countries neonatal surgery is still a challenge, especially in the emergency setting. Globally under 5 mortality is more than 10 million per annum and almost 40% of these deaths occur in the neonatal period mainly due to birth

asphyxia, prematurity, sepsis and surgery related problems.¹⁻³ In Pakistan, neonatal mortality rate is 47 per 1000 live births.⁴ In neonate, the common surgical issues encountered in emergency are largely congenital abnormalities like anorectal malformations, intestinal atresia, abdominal wall defects, meningomyelocele, tracheoesophageal fistula with esophageal atresia (TEF), intestinal obstruction and perforation. The rate of

emergency surgery is high, reaching 40% of all neonatal surgery in some settings.^{2,5}

According to international data about 2-3% of babies are born with significant congenital defects requiring admission, but our local data suggests that around 13% neonates in Pakistan are admitted with significant congenital anomalies.^{1,6,7} Despite higher admission, the burden and outcome of neonatal emergency surgery in our setup is not well documented.

The objective of this study was to measure outcome of neonatal emergency surgery in our set up in terms of mortality. The rationale of our study was to determine the possible preventable cause of mortality and the pattern of presentation of neonates requiring emergency surgery to improve overall survival.

METHODS

This retrospective study was carried out in the department of Pediatric Surgery, Mayo Hospital, Lahore from January 2015 to December 2017, after ethical review board permission. All neonates requiring emergency surgical intervention were included using non probability purposive sampling. Cases of orthopedic and neural tube defects were excluded. Sample size was calculated as 188 patients with 5% level of significance using formula⁸

$$n = \frac{Z^2 PQ}{d^2}$$

Z (Confidence level 95% is 1.96),

P (proportion of emergency surgeries in neonate is 40%)

Q = 100-P

d = 7 (permissible error for sampling variation)

Demographic details of neonate, diagnosis, procedure with findings, associated co morbid conditions like sepsis or respiratory problems, associated congenital anomalies like cardiovascular or renal, total days of stay, along with outcome (mortality/ survival) was entered on a pre designed pro forma and SPSS software version 23. Pearson's chi squared test was used to analyze association between co morbid conditions, diagnosis, findings and outcome. Logistic

regression was used to analyze association between age, gender, weight, congenital anomalies, days of hospital stay and mortality. p value of less than 0.05 was taken as significant.

RESULTS

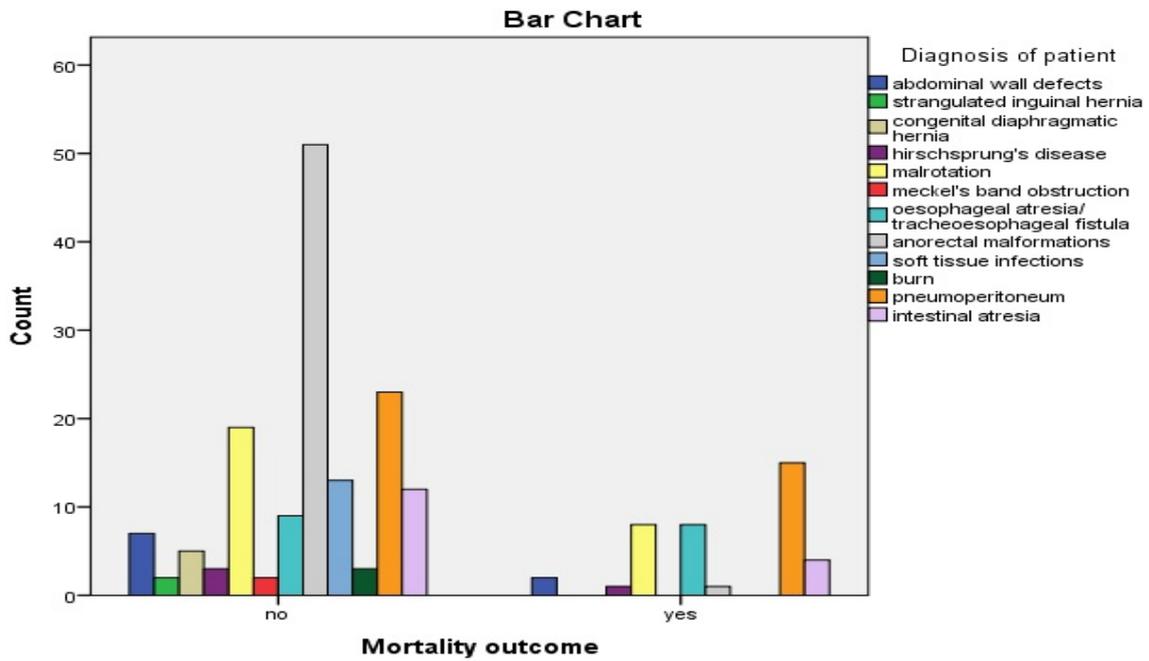
Total 188 neonates, operated in emergency and fulfilling the criteria during the study period, were included. Mean age was 7.96 ± 7.88 days (minimum 0 day, maximum 30 days). Mean weight was 2.59 ± 0.36 kilograms (min 1.8 kg, max 4.2 kg). 124(66%) were male and 64(34%) were female neonates. Co morbid conditions were noted in 9(4.8%) neonates and were not present in 179(95.2%) neonates. Associated congenital anomalies were seen in 22(11.7%) neonates, while 166(88.3%) had none. Mean days of hospital stay were 7.56 ± 6.14 days (min 0 day, max 42 days). Re exploration was done in 5(2.7%) neonates. Table 1 summarizes the details of neonates according to the pattern of presentation (diagnosis) along with procedures they underwent and findings noted and final outcome. We had 149(79.3%) survivors. Overall 39(20.7%) neonates died.

Graph 1 and Graph 2 explains the outcome of neonates according to initial diagnosis and findings noted at the time of operation.

Mortality rates in neonates with necrotizing enterocolitis was 100%, gastroschisis 100%, pneumoperitoneum with sepsis 75%, midgut volvulus was 57.1%, TEF 47%, intestinal atresia 33.3%, duodenal atresia 30% and anorectal malformations 5.4% (as seen in graph 1 and graph 2).

Diagnosis, co morbid conditions and findings of the survivors were compared with those who died using Pearson's chi squared test and association was noted between outcome and diagnosis, findings of the procedure and co morbid conditions (p value .0001), before running logistic regression. No association was found between the gender, age, weight, presence of congenital anomalies, days of hospital stay of survivors and non survivors.

Graph-1



Graph-2

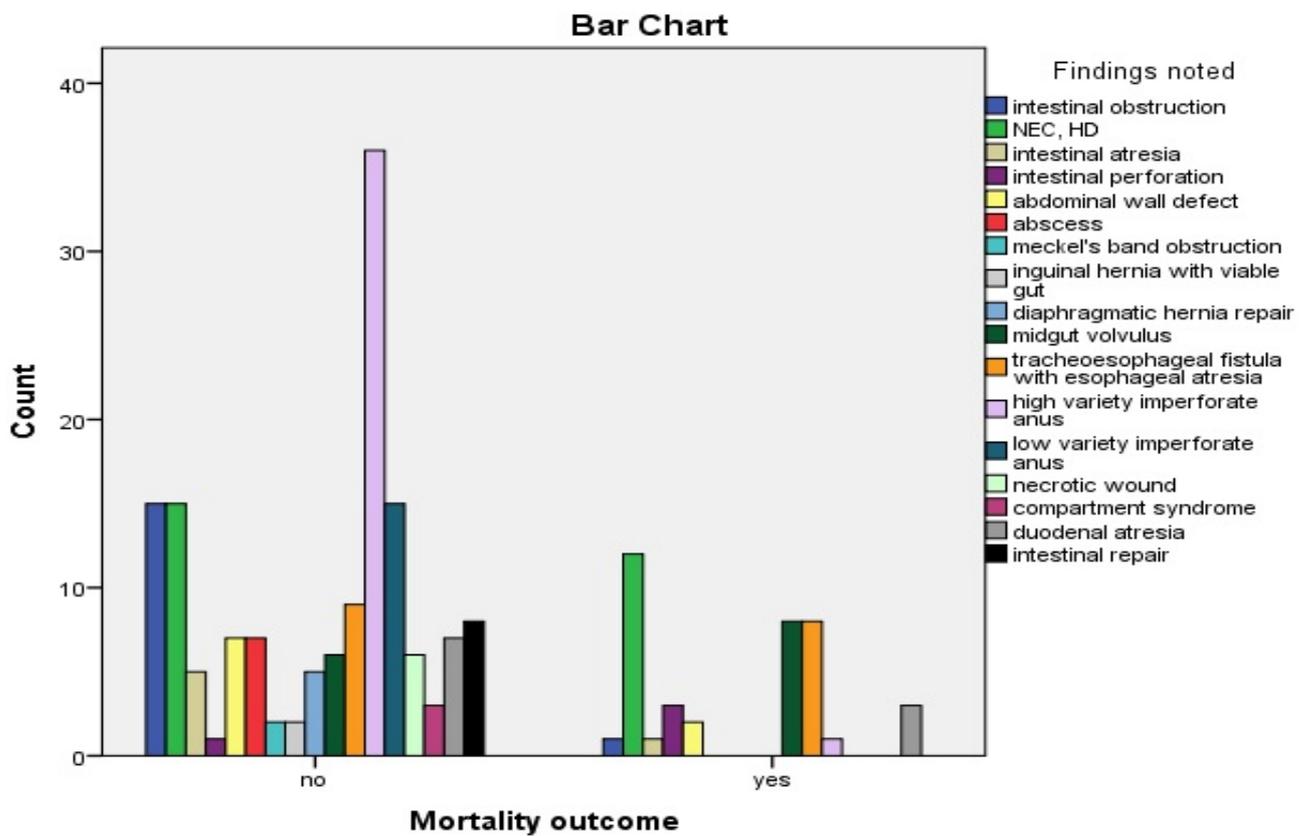


Table-1

Table-1 Distribution of Neonates according to Diagnosis, Procedure, Findings and Mortality

Sr#	Diagnosis	Patients		Findings	Procedure	Patients		Mortality (Number)
		Number	Percentage			Number	Percentage	
1	Anorectal Malformations	52	27.70%	High Variety Imperforate Anus	Sigmoid Colostomy	37	19.70%	2
				Low Variety Imperforate Anus	Anoplasty	15	8.00%	0
2	Tracheoesophageal Fistula with Esophageal Atresia	17	9.00%	Tracheoesophageal Fistula with Esophageal Atresia	Thoracotomy, Repair	17	9.00%	8
3	Hirschsprung's Disease	4	2.10%	Intestinal Obstruction	Laparotomy, Stoma	4	2.10%	0
4	Intestinal Atresia	16	8.50%	Duodenal Atresia	Duodenoduodenostomy	10	5.30%	3
				Small Bowel Atresia	Bishop Koop	6	3.20%	2
5	Pneumoperitoneum	38	20.30%	Necrotizing Enterocolitis	Laparotomy, Stoma or Repair	11	5.90%	11
				Hirschsprung's Disease	Laparotomy, Stoma	23	12.30%	0
				Intestinal Perforation	Peritoneal Drainage	4	2.10%	3
6	Congenital Diaphragmatic Hernia	5	2.70%	Congenital Diaphragmatic Hernia	Laparotomy, Repair	5	2.70%	0
7	Abdominal Wall Defects	9	4.80%	Gastroschisis	Silo Application	2	1.10%	2
				Umbilical Cord Hernia, Omphalocele	Repair	7	3.70%	0
8	Malrotation	27	14.30%	Intestinal Obstruction	Ladd's Procedure	13	6.90%	0
				Midgut volvulus	Ladd's Procedure with resection	14	7.40%	8
9	Soft Tissue Infections	13	6.90%	Necrotic Wound	Debridement	6	3.20%	0
				Abscess	Incision, Drainage	7	3.70%	0
10	Burns	3	1.60%	Compartment Syndrome	Fasciotomy	3	1.60%	0
11	Meckel's Band Obstruction	2	1.10%	Meckel's Band Obstruction	Laparotomy, Release	2	1.10%	0
12	Strangulated Inguinal Hernia	2	1.10%	Strangulated Inguinal Hernia	Herniotomy	2	1.10%	0

DISCUSSION

Incidence of neonatal emergency surgery is up to 6%.⁹ Yet neonatal surgical mortality rates differ globally. The morbidity and mortality following neonatal surgery is predominantly due to surgical site infections and respiratory problems. Poverty, poor transportation system, inadequate pre-transfer optimization, the delay in consultation, insufficient trained staff and lack of neonatal intensive care facilities (NICU) all contribute to high mortality.^{1,3,5,8} Due to these factors, the rate is 6.4% in a developed country and 62.2% in a developing country.^{10,11} In our set up overall emergency surgical mortality rate in neonates was 20.7%. A study done in Islamabad showed neonatal surgical mortality rate

to be 59.6%. This higher rate was because of delayed presentation and delayed referral because of inadequate collaboration between obstetricians, neonatologists and surgeons and also due to inadequate facilities of NICU.¹²

In our study, main pattern of presentation was gastrointestinal anomalies (anorectal malformations, intestinal obstruction, intestinal perforation) in 75.1% cases. TEF was seen in 9% cases, abdominal wall defects in 4.8% and congenital diaphragmatic hernia in 2.7% cases. This pattern is similar to a study conducted in Nigeria showing 82% gastrointestinal anomalies, 10% TEF and 18% abdominal wall defects.¹⁰ Akhter et al also showed that main cause of surgery was gastrointestinal in 64% cases, 25.2%

TEF and 2.6% abdominal wall defects.¹²

We found correlation between co morbid conditions, diagnosis, findings and outcome. Mortality was mainly noted in neonates presenting with necrotizing enterocolitis, midgut volvulus, septic neonates of gastroschisis and intestinal perforation. These findings are similar to study conducted by Catre D et al, in which main cause of mortality was necrotizing enterocolitis, preterm and low birth weight babies.¹¹ In a systematic review, mortality rate of more than 50% was seen in Africa in cases of intestinal perforation, TEF, ruptured abdominal wall defects and congenital diaphragmatic hernia; thus corroborating with our findings.^{3,13}

Our study does not show any association of age, weight, gender and presence of congenital anomalies with outcome. Other studies suggest that preterm, low birth weight and multiple congenital anomalies are associated with decreased survival of neonates.^{3,5,7,13} Larger sample size and multi centre studies are required to confirm these findings.

We could not interpret how late neonates presented or were referred to us as records were inadequate and whether this was main factor causing mortality in cases of necrotizing enterocolitis and midgut volvulus. The factors affecting mortality in our study appeared to be sepsis and respiratory insufficiency.

Even being a university hospital in Pakistan, we lack a well equipped NICU. Government with the help of various international donor agencies should provide adequate budget to improve infrastructure. This will help in increasing the survival of neonates.

CONCLUSION

Overall neonatal surgical mortality rate in our set up was 20.7% and was mainly seen in cases of gastrointestinal anomalies like necrotizing enterocolitis, mid gut volvulus, pneumoperitoneum with sepsis and in cases of tracheoesophageal fistula with esophageal atresia and gastroschisis.

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